

REMARKS

I. STATUS OF THE CLAIMS

Claims 72-146 are pending and under consideration on the merits. By the above amendment, claims 72-74, 76-80, 82-86, 122, and 128-132 have been amended to improve their clarity, but not to alter the scope of the claim language.

Support for the above amendments may be found in the as-filed Specification and claims, for example, in original claims 1-71. Applicants therefore submit that these amendments raise no issue of new matter.

II. RESPONSE TO CLAIM REJECTIONS

In the pending Office Action, the Office rejects:

- claims 72-96, 99, 101-115, 124-133, 136-144, and 146 under 35 U.S.C. § 103(a) as being unpatentable over a combination of 35 U.S.C. § 103(a) as being unpatentable over a combination of European Publication No. EP 1193085 to Larson ("Larson") and U.S. Patent No. 5,238,991 to Magnus ("Magnus") (See Office Action, pages 2-5); and
- claims 97, 98, 100, 116-123, 134, 135, and 145, under 35 U.S.C. § 103(a) as being unpatentable over Larson, Magnus, and U.S. Patent No. 4,871,004 to Brown ("Brown"). See Office Action, pages 5-6 (See *id.* at 6).

A. 35 U.S.C. § 103(a) rejection in view of Larson and Magnus

According to the Office, Larson discloses each and every element of claims 72-96, 99, 101-115, 124-133, 136-144, and 146, except for the claimed methylene donor and methylene acceptor compound. See Office Action, pages 2-5. To correct this deficiency, the Office relies on Magnus for the disclosure of vulcanizable rubber compositions containing methylene donor and acceptor compounds. See *id.* at 2. The Office then alleges that Magnus' methylene donor/acceptor compounds would have been recognized by one of ordinary skill in the art as falling within the scope of the

“commonly used additive materials” that Larson indicates may be used in its rubber compositions. See *id.* From this, the Office appears to conclude that it would have been obvious to one of ordinary skill in the art to add Magnus’ methylene donor/acceptor compounds to the rubber compositions of Larson, “in order to improve mechanical properties and bonding with adjacent [reinforcing] elements” *Id.*

Applicants respectfully disagree, and traverse this rejection for at least the following reasons.

The Office bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. See M.P.E.P. § 2142. In *KSR Int’l Co. v. Teleflex Inc.*, 82 U.S.P.Q.2d 1385 (2007), the Supreme Court confirmed that the “framework for applying the statutory language of §103” was still based on its landmark decision in *Graham v. John Deere Co. of Kansas City*, 148 U.S.P.Q. 459 (1966). Under *Graham*, there are four factors for consideration when determining whether an invention is obvious:

- (1) the scope and content of the prior art;
- (2) the differences between the prior art and the claims at issue;
- (3) the level of ordinary skill in the art; and
- (4) secondary considerations.

148 U.S.P.Q. at 467. The obviousness or non-obviousness of the claimed invention is then evaluated in view of the results of these inquiries. See *Graham*, 148 U.S.P.Q. 467; see also *KSR*, 82 U.S.P.Q. 2d at 1388. As articulated in *KSR*, part of this evaluation involves determining “whether there was an apparent reason to combine” the prior art elements relied upon to establish obviousness. 82 U.S.P.Q. 2d at 1369.

In the present case, Applicants submit that Larson and Magnus do not support a *prima facie* case of obviousness with respect to any of the pending claims, at least because they fail (alone or in combination) to teach or suggest a crosslinked elastomeric composition comprising the claimed combination of diene, layered material, methylene donor compound, and methylene acceptor compound. See claims 72 and 127. Further, as will be discussed in detail below, the Applicants have found that a crosslinked elastomeric composition comprising the claimed combination of components can exhibit a combination of relatively low viscosity, increased dynamic modulus and low $\tan\delta$, which one of ordinary skill would not have reasonably predicted from the disclosure of the cited references.

1. The cited references do not teach or suggest each and every element of the pending claims.

Larson generally discloses the use of intercalated clay particles and exfoliated particles in rubber compositions suitable for use in tire components. See Larson at [0002]. In particular, Larson discloses a rubber composition comprising, *inter alia*, 100 phr of a diene elastomer (e.g., 1, 4-isoprene), 1-10 phr of intercalated smectite particles (e.g., montmorillonite), and 20-99 phr of a reinforcing filler (e.g., carbon black or silica). See *id.* at [0020]. Larson further states its constituent rubbers may be mixed with additives commonly used in tire rubbers. See *id.* at [0047].

However, Larson is silent with respect to adding methylene donor compounds or methylene acceptor compounds to its disclosed elastomeric compositions, and certainly does not suggest the addition of a combination of these materials to its compositions. Indeed, the Office admits this fact at page 2 of the pending Office Action.

Magnus does not cure the deficiencies of Larson discussed above. Magnus discloses vulcanizable rubber compositions (e.g., diene containing polymers) that are suitable for use in tire components, and which contain a polyfluoroethylene (PFE) and/or PFE compatibilizer. See Magnus, column 1, lines 55-58 and column 4, lines 17-59. Magnus also discloses the addition of an in situ generated resorcinol-formaldehyde (RF) resin to a diene containing rubber for the purpose of improving rubber stiffness. See *id.* at column 4, line 60-column 5, line 4. The RF resin is generally formed of a condensation product of a methylene donor (e.g. melamine) and a methylene acceptor (e.g., resorcinol). See *id.*

However, Magnus does not appear to provide any information that would lead one of ordinary skill in the art to conclude that an RF resin (i.e. a methylene donor/acceptor complex) is compatible with a rubber composition that comprises a layered material, such as the smectite clays that are central to the disclosure of Larson. Thus, like Larson, Magnus fails to teach or suggest an elastomeric material comprising the claimed combination of diene, layered material, methylene donor compound, and methylene acceptor compound. See *id.*

Accordingly, while Larson and Magnus may each disclose individual components of the claimed elastomeric composition, they fail to teach or suggest the *combination* of these components in a single crosslinkable elastomeric composition, as claimed, with any reasonable expectation of predictability. See claims 72 and 127. Thus, Applicants submit that the burden remains on the Office to provide a tenable rationale explaining *why* one of ordinary skill would modify Larson in an attempt to arrive at the claimed invention.

In the Office Action, the Office asserts that one of ordinary skill would have found it obvious to add Magnus' RF resin to Larson's elastomeric compositions, because they are "commonly used additive materials" used to increase the stiffness of a rubber composition. See office Action, pages 2, 3, and 6. Applicants disagree, at least because it is unclear why a person of ordinary skill in the art would modify Larson -- which uses clay particles to increase the storage modulus of a diene elastomer by 43-58% -- so as to include additive components (i.e., RF Resin) that *further increase* elastomer stiffness. See Larson at [062]. Indeed, Larson's elastomers appear to function perfectly well for their intended purpose without modification, and none of the references explain *why* one of ordinary skill would see any benefit to further increasing the stiffness of Larson's compositions.

For at least the foregoing reasons, Applicants submit that Larson and Magnus do not teach or suggest each and every element of the amended claims.

2. One of ordinary skill could not have reasonably predicted the properties exhibited by a elastomeric composition comprising the claimed components from the cited references.

Applicants also disagree with the Office's position, at least because the properties exhibited by an elastomeric composition comprising the claimed combination of materials could not have been reasonably predicted by one of ordinary skill in the art from the disclosures Larson and Magnus. See *generally* M.P.E.P. § 2143.¹ In support

¹ M.P.E.P. § 2143 details seven exemplary rationales that may be used to establish a *prima facie* case of obviousness. Five of those rationales focus on modifications that one of ordinary skill in the art could use to a solution or result that is *predictable*. See M.P.E.P. § 2143.

of this position, Applicant directs the Office to Tables 1 and 2 on pages 32 and 35 of the as-filed Specification.

As shown in Table 1, Applicants prepared five exemplary rubber compositions (i.e., examples 1 through 5). See Specification, page 32. All of these examples contain the same type and amount of natural rubber, carbon black, zinc oxide, stearic acid, silane coupling agent, sulfur, retardant, and accelerator. See *id.* However, these examples differ with respect to the presence and amount of discontinuous fibers, layered material, and/or methylene donor/acceptor compounds in the elastomeric composition. See *id.* Specifically:

- example 1 contains no discontinuous fibers, layered material, or methylene/donor compounds;
- example 2 contains layered material, but no discontinuous fibers or methylene donor/acceptor compounds;
- example 3 contains methylene donor/acceptor compounds, but no layered material or discontinuous fibers;
- example 4 contains a combination of methylene donor/acceptor compounds and layered material, but does not include discontinuous fibers; and
- example 5 contains a combination of methylene donor/acceptor compounds , layered material, *and* discontinuous fibers.

See *id.*

The measured static and dynamic mechanical properties of samples 1-5 are reproduced in Table 2 of the as-filed specification. The measured dynamic modulus (E') at 23 °C and 70 °C and $\tan\delta$ at 23 °C and 70 °C are reproduced below. The parenthetical numbers represent the percent change of the measured property relative to example 1.

Example	1	2	3	4	5
E' (23°C)	10.59	13.25 (27.67%)	15.90 (50.14%)	23.81 (124.8%)	24.67 (132.9%)
E' (70°C)	9.06	10.44 (15.23%)	11.96 (32.0%)	19.11 (110.9%)	20.47 (125.9%)
Tandelta (23°C)	0.247	0.272 (10.12%)	0.253 (2.43%)	0.233 (-5.66%)	0.228 (-7.70%)
Tandelta (70°C)	0.159	0.192 (20.75%)	0.172 (8.17%)	0.166 (4.40%)	0.160 (0.63%)

Specification, page 35.

As shown, examples 2-5 (which contain layered material; methylene donor/acceptor compounds; a combination of layered material and methylene donor/acceptor compounds; and a combination of layered material, methylene donor/acceptor compounds, and discontinuous fibers, respectively) each exhibited significantly increased dynamic modulus (E') relative to example 1 (which contains no layered material, methylene donor/acceptor compounds, or discontinuous fibers). The fact that there were increases in dynamic modulus (E') is generally in line with the individual disclosures of Larson and Magnus, which *individually* use layered material and methylene donor/acceptor compounds, or discontinuous fibers to raise the stiffness of an elastomeric material. However, nothing in Larson or Magnus suggests that a combination of layered material and methylene donor/acceptor compounds would act synergistically in a rubber composition to produce material properties that far exceed the expected sum of the individual contributions of each component.

This synergistic effect is clearly demonstrated by comparing the properties of examples 2 and 3 to the properties of inventive example 4. Consider the dynamic modulus (E') at 70°C, for example: while layered material alone (example 2) increased the value by 15.23% and methylene donor/acceptor compounds alone (example 3)

increased the value by 32.0%, the combination (inventive example 4) increased the value by 110.9%, far in excess of the additive effect of 47.23%.

Table 2 also demonstrates the unpredictable effect of the combination on tandelta, both at 23 °C and 70 °C.² Indeed, while the tandelta at 23°C of examples 2 and 3 show an *increase* in tandelta relative to example 1, the combination (inventive example 4) showed an unpredictable *decrease* in tandelta.

With this in mind, none of the cited references teach or suggest that an elastomeric composition exhibiting a combination of higher dynamic modulus and lower tandelta could be obtained by combining a diene with layered material and methylene donor/acceptor compounds, as claimed. See claims 72 and 127. Indeed, Larson discloses that the addition of layered material to a diene elastomer *increases* tandelta, relative to the unmodified diene. See Larson at [0062]. Moreover, Magnus is silent with respect to the impact of methylene donor/acceptor compounds on the tandelta of a diene elastomeric composition.

Thus, one of ordinary skill in the art could not have reasonably predicated from the cited references that an elastomeric composition comprising the claimed combination of materials would exhibit a combination of substantially increased dynamic modulus *and* lowered tandelta. Moreover, the Office has not explained *why or how* one of ordinary skill in the art would understand from Larson and Magnus that an

² As explained by Larson, tandelta is well known to be a measurement of hysteresis. See Larson at [0062]. Lower tandelta correlates to reduced rolling resistance, which in turn relates to improved vehicular fuel economy. Thus, in regards to tire production, materials having lower tandelta are generally more desirable than those having higher tandelta.

elastomeric composition comprising the claimed components could exhibit both of these desirable properties in combination.

For at least the foregoing reasons, Applicants submit that the Office has not established that the cited references establish a prima facie case of obviousness with respect to any of the pending claims, at least because the cited references, whether considered alone or in combination, do not teach or suggest each and every element of the claims. In addition, the Office has not established that one of ordinary skill could have reasonably predicted that an elastomeric composition comprising the claimed combination of components would exhibit a desirable combination of increased dynamic modulus and low tandelta.

Applicants therefore submit that the applied 35 U.S.C. § 103(a) rejection of claims 72-96, 99, 101-115, 124-133, 136-144, and 146 under 35 U.S.C. § 103(a) as being unpatentable over a combination of Larson and Magnus is improper, and should be withdrawn.

B. 35 U.S.C. § 103(a) rejection in view of Larson, Magnus, and Brown

The Office rejects claims 97, 98, 100, 116-123, 134, 135, and 145 under 35 U.S.C. § 103(a) as being unpatentable over a combination of Larson, Magnus, and Brown for the reasons set forth on pages 5-6 of the Office Action. Generally, the Office asserts that it would have been obvious to one of ordinary skill in the art at the time the invention was made to include aramid reinforcement fibers, as disclosed by Brown, in the rubber composition produced by the proposed combination of Larson and Magnus. See Office Action, page 6.

In response, Applicants respectfully disagree with and traverse this rejection for substantially the same reasons as set forth above against the proposed combination of Larson and Magnus. Like Larson and Magnus, Brown fails to teach or suggest an elastomeric composition comprising a combination of a diene and layered material recited in claims 72 and 127, much less the combination of a diene, layered material, and reinforcing fibers recited, for example, in claims 116 and 145. Brown also fails to provide any information that would indicate that one of ordinary skill in the art could reasonably predict that the claimed combination of a diene, layered material, and methylene donor/acceptor compound would produce a synergistic effect and attendant properties that far exceed the contributions of each individual additive. Indeed, as shown in Table 2 of the as-filed Specification, which is replicated above, inventive example 5 (which contains a combination of diene, layered material, methylene donor/acceptor compound, and discontinuous fibers) exhibited even better dynamic modulus (E') and tan delta properties than inventive example 4 and, of course, unexpectedly superior than examples 1-3.

For at least the foregoing reasons, Applicants submit that the Office has not established that the cited references establish a prima facie case of obviousness with respect to any of the pending claims, at least because the cited references, whether considered alone or in combination, do not teach or suggest each and every element of the claims. In addition, the Office has not established that one of ordinary skill could have reasonably predicted that an elastomeric composition comprising the claimed combination of components would exhibit a desirable combination of increased dynamic

modulus and low tandelta. Rather, Applicants' data establishes the unpredictable nature of the art.

Applicants therefore submit that the applied 35 U.S.C. § 103(a) rejection of claims 97, 98, 100, 116-123, 134, 135, and 145 under 35 U.S.C. § 103(a) as being unpatentable over a combination of Larson, Magnus and Brown is improper, and should be withdrawn.

III. CONCLUSION

In view of the foregoing amendments and remarks, Applicants respectfully request reconsideration and reexamination of this application and the timely allowance of the pending claims.

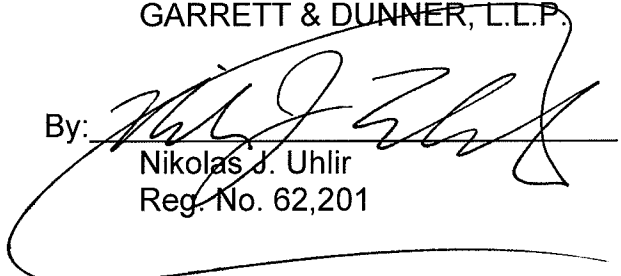
Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account no. 06-0916.

Respectfully submitted,

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